

# OSTRACODS FROM THE MOUND SPRINGS AREA BETWEEN STRANGWAYS AND CURDIMURKA, SOUTH AUSTRALIA

by P. DE DECKKER\*

## Summary

DE DECKKER, P. (1979) Ostracods from the mound springs area between Strangways and Curdimurka, South Australia. *Trans. R. Soc. S. Aust.* **103**(6), 155-168, 31 August, 1979.

*Ngarawa dirga* n.gen., n.sp. of the new subfamily Ngarawinae, is described from mound springs and spring seeps in the Strangways-Curdimurka area, southwest of Lake Eyre South. Two other cyprididid ostracods are recorded from temporary pools in the same area: *Reticypris walbu* n. sp. and *Heterocypris tatei* (Brady, 1886). The latter species is redescribed and recorded from some mound springs.

## Introduction

Natural artesian springs commonly occur along the edge of the Great Artesian Basin and some are in the area between Strangways and Curdimurka, South Australia. Some of these consist of dome-shaped structures or "mounds" (Fig. 1) from which water flows slowly. Inside the open domes, small pools often occur which overflow through a "seep" (Fig. 2). The waters from these springs are commonly slightly saline and alkaline having conductivities of up to 9000 millimhos/cm. Spring water temperatures are usually high (e.g. 18-30° in early October 1978), those of the seeps characteristically higher than the pools. As the mound springs are the only



Fig. 2. Seep on mound at Horse Springs. This narrow and very shallow waterbody is covered at the bottom with encrusting algae on which the ostracod *Ngarawa dirga* n. gen., n. sp., and the isopod *Phreatomerus latipes* are crawling. The water depth is sometimes only a few millimetres. (Photo B. D. Mitchell).



Fig. 1. Mound at Horse Springs. Note the characteristic cone shape of the spring. The sides of the spring are made of calcareous encrustations leached by the spring waters. Distance across the top of the spring is approximately 20 m. (Photo B. D. Mitchell).

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prominent water bodies in an arid area, they might be expected to provide unique habitats for an endemic fauna, as is the case for the remarkable phreatoicid isopod *Phreatomerus latipes* (Chilton, 1922). As yet undescribed gastropods collected from the same mound springs are also endemic (B. V. Smith *in litt.* to B. D. Mitchell, 24.xi.1978). One new ostracod genus and new species is a common inhabitant of the mound springs and their seeps, and believed to be endemic to the area. For further details of the area, refer to Cobb (1975) and Mitchell (*in press*).

The material analysed here was collected by B. D. Mitchell during the period of 30.ix.-3.x. 1978 during an investigation of the mound springs by the Nature Conservation Society of South Australia. Some collections made by K. F. Walker in the same area were also examined.

The specimens used for the description of the three ostracod species are deposited at the Australian Museum (AM P28669-P28692). Paratype material is also deposited at the South Australian Museum, British Museum (Natural History) and U.S. National Museum.

Aboriginal words are used here to name the new ostracods because the area where they were collected is rich in myths of the Arabunna people.

### Systematic Descriptions

Subclass: OSTRACODA Latreille, 1806

Order: PODOCOPIDA Müller, 1894

Superfamily: CYPRIDACEA Baird, 1845

Family: CYPRIDIDAE Baird, 1845

Subfamily: NGARAWINAE new subfam.

*Type genus: Ngarawa dirga* n. gen., n. sp.

*Diagnosis:* Carapace: left valve with dorsal hump and slightly larger than right valve; edge of right valve with faint tuberculation posteriorly; broad selvage near edge of left valve but forming edge of right valve; calcified inner lamella broad anteriorly; central muscle scars

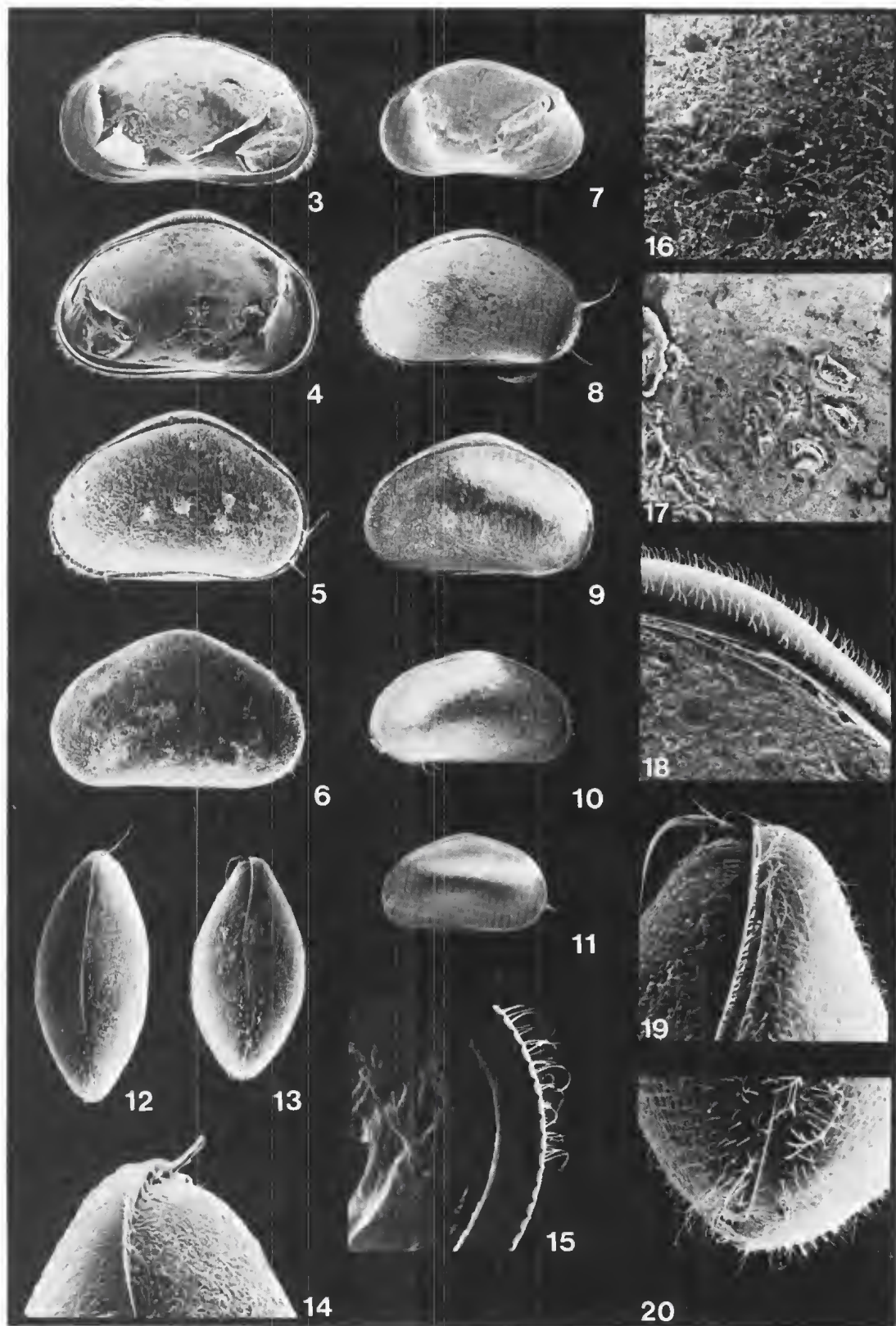
consisting of 6 scars at the maximum arranged in circle; 2 on top with one or 2 below in centre, and 2 others below; 2 mandibular scars below and in front; radial pore canals numerous, straight and arranged in groups of 2 and sometimes bifid; 4 rows of seminal vesicles forming U-shape in posteroventral area and forming 2 loops, one clockwise in dorsal area around central muscle field, the other anticlockwise in posterodorsal area.

*Anatomy:* antennula 7 segmented with one thick and straight bristle at the end of last segment; antenna with small unequal natatory setae; mandibular endopod with  $\alpha$  bristle long, narrow and with pilose distal end,  $\beta$  bristle with small and fine short hairs and  $\gamma$  bristle very long and with pilose tip; rake-like organ with 6 teeth; last segment of maxillular palp trapezoid; the 2 Zahnborsten on 3rd lobe of maxillula with teeth; male maxillary palps almost identical with 2 long and narrow bristles plus 6 pilose bristles on epipod; Zenker organ with both ends rounded and bearing 25 rosettes; furca with 2 long claws almost equal in length and 2 bristles; furcal attachment with one ventral extension near articular extremity, 2 small dorsal branches and a bifid ventral one; no spine on posterior of body.

*Remarks:* This new subfamily is at present monospecific. The Ngarawinae resembles the Cyprinotinae in dorsal hump in left valve and tuberculate edge of one valve, but differs from it by possessing a trapezoid end segment of maxillular palp, almost identical maxillary palps in males, different shaped hemipenis (in Cyprinotinae it usually has a boot shaped lateral lobe) and furcal attachment with 2 dorsal branches and a ventral process near articular extremity.

The furcal attachment, which was shown by Rome (1969) to be an important feature for distinguishing various subfamilies within the Cypridacea, separates *Ngarawa* from *Prionocypris* Brady & Norman, 1896, redescribed by

Figs. 3-20. *Ngarawa dirga* n. gen., n. sp. Female paratypes. 3: internal lateral RV; 4: internal lateral LV; 5: external lateral of carapace showing mainly RV; 6: external lateral of carapace LV. Male holotype. 7: Internal lateral RV. Male paratypes. 8: external lateral of carapace RV; 9: external lateral of carapace RV; 10: external lateral of carapace RV. Juvenile. 11: lateral of carapace RV. Female paratypes. 12: dorsal of carapace; 13: ventral of carapace; 14: detail of Fig. 12, anterior area of carapace. Male holotype. 15: detail of Fig. 7, posterior area. Male paratype. 16: detail of Fig. 8, central muscle scars; note photo at an angle from original. Female paratype. 17: detail of Fig. 3, central muscle scars. Male holotype. 18: detail of Fig. 7, dorsal area. Female paratype. 19: detail of Fig. 13, anterior area of carapace; 20: detail of Fig. 13, anterior area of carapace.  
LV, RV = left valve, right valve. Figs 3-13: approx. 30x; 14-20: approx. 150x.



Danielopol & McKenzie (1977), which, otherwise resembles the former genus in many anatomical details. However, the similarity of the furcal attachment of *Ngarawa* with those of the genera included with the Herpetocypridinae still does not necessitate the association of this genus with *Herpetocypris*, *Ilyodromus* and *Psychrodromus* because the furca, another distinguishing taxonomic feature at the subfamily level, has different types of bristles. Therefore the Ngarawinae could be a transition form between the Herpetocypridinae and the Cyprinotinae. Whether or not it is ancestral to these families is not yet known.

**Ngarawa n. gen.**

*Type species: Ngarawa dirga* n. sp., gender feminine.

*Diagnosis:* Same as for subfamily Ngarawinae.

*Derivation of name:* From guda ngarawa in Arabunna vocabulary meaning mound spring, the typical habitat of that ostracod (guda meaning water).

**Ngarawa dirga** n. sp.

Figs. 3-34.

*Holotype:* Adult male, AM P8680.

*Paratype:* Ovigerous female, AM P8677.

*Type locality:* Blanche Cup Spring (lat. 29° 27' 08" S; lon. 136° 51' 04" E).

*Derivation of name:* Dirga meaning literally "oven" in the Arabunna vocabulary for Blanche Cup Spring.

*Description:* Carapace (External). Holotype adult male: length LV 1.13 mm, RV 1.10 mm; height LV 0.74 mm, RV 0.66 mm. Paratype adult female: length LV 1.20 mm, RV 1.18 mm; height LV 0.74 mm, RV 0.66 mm. In lateral view triangular in shape with dorsal hump in LV; greatest height at almost middle in both sexes; LV overlapping RV all along its edge; in dorsal view carapace narrow, and strong dorsal overlap of LV anteriorly and posteriorly; very broad overlap of LV in ventrum area; dorsum strongly arched and ventrum almost flat; length height ratio smaller

in female; surface of shell very hairy in adults, less pilose in juveniles; normal pore canals simple and funnel shaped.

(Internal). Faint tuberculation (Fig. 15) on posterior edge of RV in both sexes; broad sclavage near edge of valve in LV whereas it is forming the edge of RV; calcified inner lamella broad anteriorly in both valves and about 3 times its width posteriorly. Hinge: in LV fine groove below hump (Fig. 18) and ridge in RV which is interlocking below hump of LV. Central muscle scars (Figs 16-17) arranged in circle with 2 scars on top and one or 2 below in centre (posterior one placed higher) and 2 others below; 2 mandibular scars below and in front. Radial pore canals straight, arranged in groups of 2 and sometimes bifid in anterior area of LV. Seminal vesicles U-shaped posteroventrally and curling clockwise around and above central muscle field and anticlockwise in posterodorsal area.

Anatomy. Antennula: (Fig. 21); 7 segmented; length/width ratio of last 6 segments:

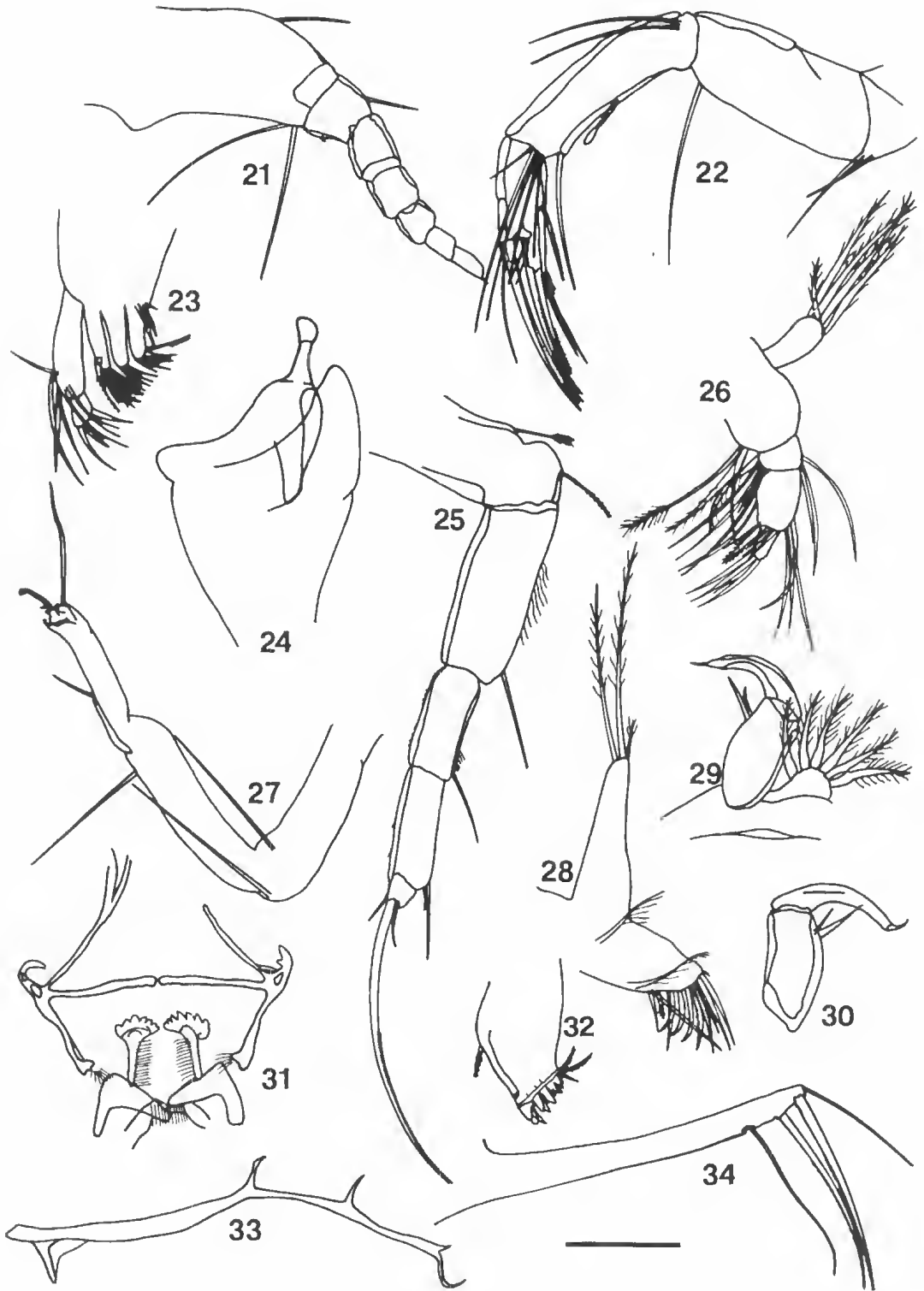
$\frac{7}{8}$ ,  $\frac{7}{7}$ ,  $\frac{8}{6.5}$ ,  $\frac{5}{5.5}$ ,  $\frac{4.5}{3.5}$ ,  $\frac{5}{2.5}$ ; last segment with

thick and stiff bristle as long as last 5 segments and half length of other setae; sensory organ on 2nd segment small, transparent and rod-shaped.

Antenna: (Fig. 22); sexually dimorphic; sense club attached at mid length on 1st segment; natatory setae unequal and not reaching tips of claws; 4 claws: the one fixed to 3rd segment being shortest and longer in male. In female, a thick seta with long hairs protrudes from last segment.

Mandible: mandibular coxale (Fig. 32) with last molar slender and longer than last 3; near its base: 2 pilose short bristles; endopod (Fig. 26) with  $\alpha$  bristle long, narrow and with few distal spines,  $\beta$  bristle small and with fine, short hairs and  $\gamma$  bristle with fine hairs at distal end, as long as setac with double row of spines (for terminology see Danielopol & McKenzie 1977) and near the latter ones, presence of a small bristle; epipod plate with 5 plumose Strahlen.

Figs. 21-34. *Ngarawa dirga* n. gen., n. sp. Male holotype. 21: antennula (segments only); 22: antenna; 23: maxillular palp with lobes; 24: hemipenis; 25: thoracopoda I; 26: mandibular endopod; 27: thoracopoda II. Female paratype. 28: maxilla. Male holotype. 29: maxilla, detail of palp; 30: maxilla, detail of other palp. Female paratype. 31: detail of lower lip in mouth area including rake-like organs; 32: detail of mandibular coxale. Male holotype. 33: furcal attachment; 34: furca. Scale: 100 $\mu$ .



Rake-like organ: (Fig. 31); 6 teeth with inner one bifid; teeth decreasing in size and width towards inside.

Maxillula: (Fig. 23); length/width ratio of palp segments:  $\frac{15}{4.5}$ ,  $\frac{3.5}{4}$ ; last segment trapezoid and with 3 thick bristles; 3rd lobe with 2 Zahnborsten: 3-4 teeth on anterior Zahnborste of male, 6-3 in female and 4-2 on posterior Zahnborste in both sexes.

Maxilla: sexually dimorphic: in male, prehensile palps (Figs 29-30) almost identical and with 2 long bristles; epipod with 6 plumose Strahlen; in female (Fig. 28) endopod with 3 unequal plumose setae: the middle one being the longest and 6 times as long as small one and  $\frac{5}{4}$  the other: protopod with 12 terminal bristles, one subterminal one and another near base of endopod.

Thoracopoda I: penultimate segment divided; terminal claw longer than last 2 segments; for detail of setae, see Fig. 25.

Thoracopoda II: terminal segment with one pincer and 2 unequal setae, the smallest hook-shaped and bearing small teeth; for details of setae see Fig. 27.

Hemipenis: for outline refer to Fig. 24.

Zenker organ: bearing 25 rosettes and both ends rounded.

Furca: (Fig. 34); 2 long claws and 2 long bristles; anterior claw slightly longer than posterior and almost  $\frac{2}{3}$  length of shaft; both claws pectinate along  $\frac{2}{3}$  of length down to tip; anterior bristle, flagellum like, almost same length as posterior claw; distance along shaft between posterior bristle and claw;  $\frac{1}{11}$  of length of shaft.

Furcal attachment: (Fig. 33); one ventral extension near articular extremity (= terminology of Rome 1969) which is almost perpendicular to median part; two small dorsal branches, almost as long as ventral extension,

one at mid-length and other at  $\frac{3}{4}$  length from articular extremity; ventral branch bifid with lower part longer and hook-shaped.

Posterior end of body: smooth, no spine.

Eye: cups of nauplius eye fused; colour: brown.

Colour of valves: light green (in type locality) to brown-orange (e.g. the Bubbler).

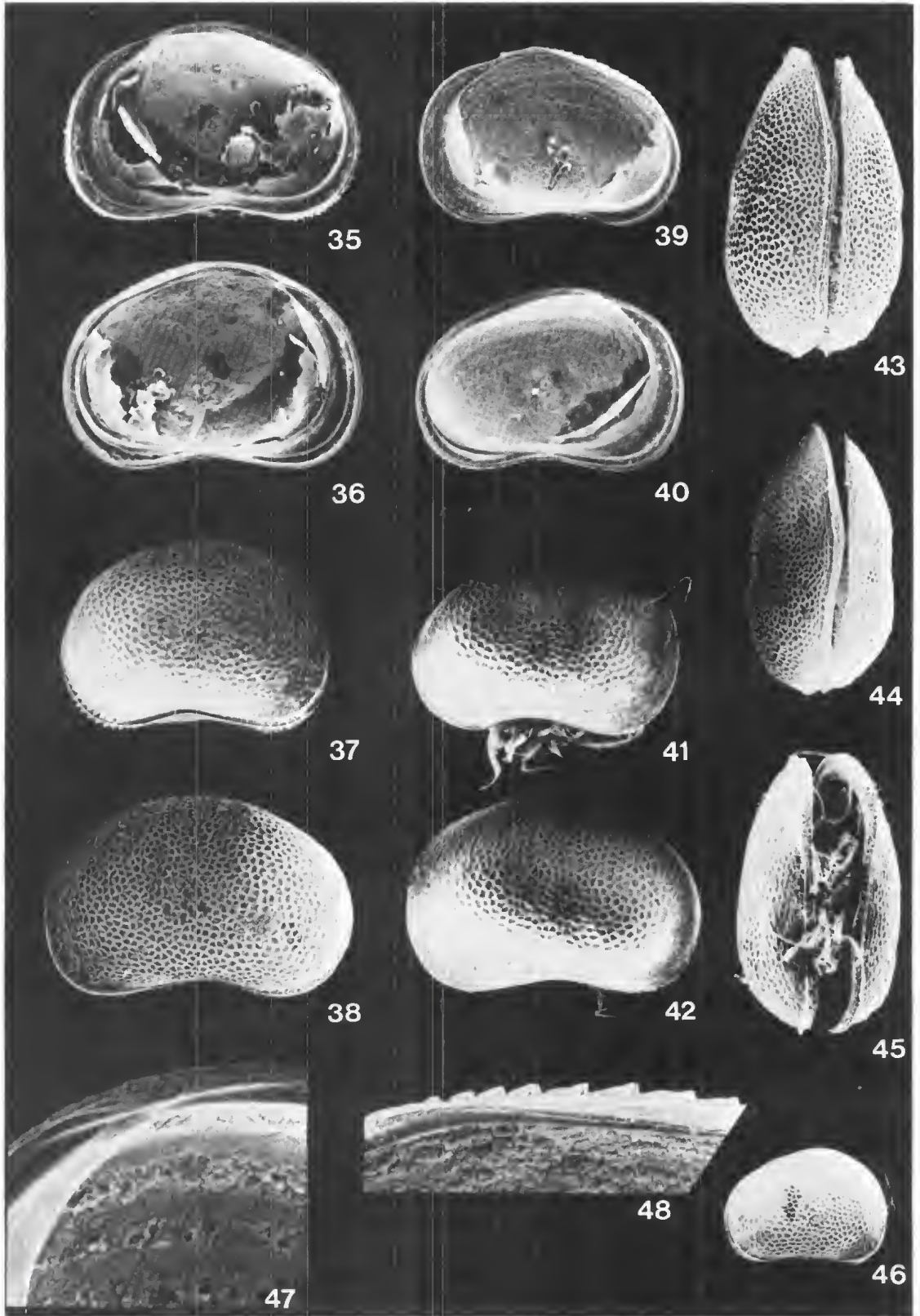
*Ecology*: *Ngarawa dirga* is a benthic ostracod found in most springs in the Strangways-Curdimurka area. B. D. Mitchell collected specimens of this species from the following: Hamilton Hill Homestead Spring (T. 18°C, cond. 8970 mmho); unnamed spring near Blanche Cup; Blanche Cup (T. 14°C, cond. 6952 mmho); The Bubbler (T. 30°C, cond. 5943 mmho); Coward Spring Railway Bore—swamp; Coward Springs (T. 28°C, cond. 6811 mmho); Warburton Spring; Strangways Spring. *N. dirga* was also collected from 2 mound springs seeps: Horse Springs Seep (T. 23°C, cond. 7047 mmho) and Blanche Cup seep (T. 28°C). K. F. Walker collected *N. dirga* on 30.xi.1975 from the Blanche Cup Spring (T. 29°C), the Bubbler (T. 31°C) and the Little Bubbler (T. 28.5°) near the latter spring. For all these localities refer to the 1:250 000 Curdimurka topographic map.

Mitchell noticed that in the seeps, *N. dirga* was crawling on a rocky bottom covered with algae and also within sandy sediment. The water depth in places was a few millimetres. *N. dirga* was not found swimming, a fact explained by the undeveloped natatory setae on its antennae and the presence of a thick bristle attached to the last antennular segments which would be useful for crawling. It is likely that the abundant hairs covering the carapace of *N. dirga* are of some use in keeping the animal moist by trapping a water film or bubbles around the shell, and in maintaining the animal's vertical position by the hairs acting as lateral stabilizers when water is depleted within the seeps. Abundant hairs are also

Figs. 35-48. *Reticypris walbu* n. sp. Female paratypes. 35: internal lateral RV; 36: internal lateral LV; 37: external lateral of carapace RV; 38: external lateral of carapace LV. Male paratypes. 39: internal lateral RV; 40: internal lateral LV; 41: external lateral of carapace RV; 42: external lateral of carapace LV. Female paratype. 43: dorsal of carapace. Male paratypes. 44: dorsal of carapace; 45: ventral of carapace. Juvenile. 46: lateral RV. Female paratype. 47: detail of Fig. 35, dorsal area. Male paratype. 48: detail of Fig. 39, postero-dorsal area.

Figs. 35-46: approx. 15x; 47-48: approx. 240x.

Specimens illustrated in Figs. 39-45 have been destroyed.



present on *Mesocypris* ssp. and *Scottia audax* (Chapman, 1961) new comb. which are semi-terrestrial ostracods found in eastern Australia.

D. L. G. Williams provided me with some core material from Strangways Springs in which valves of *N. dirga* were abundant within sandy sediment up to a depth of 1 m below water level.

Subfamily: DIACYPRIDINAE\* McKenzie  
1978

Genus RETICYPRIS McKenzie, 1978

*Reticypriis walbu* n. sp.

Figs. 35-63.

*Holotype*: Adult male, AM P28688.

*Paratype*: Ovigerous female, AM P28689.

*Type locality*: Pool in Margaret River, S.A. (lat. 29° 22' 38" S; long. 136° 46' 52" E).

*Derivation of name*: Walbu in Arabunna terminology meaning rib bone for the saw-like appearance of the dorsal edge of the shell. Walbu relates to the particular myth at the Blanche Cup and Bubbler Springs when a mythological hero captured and cooked in a spring a large snake, discarding the rib bones to form the white encrustations seen at the edge of the spring.

*Diagnosis*: Saw tooth like ornamentation in the dorsal area of the shell, and posterior edge of both valves with broad denticulation. Shape of hemipenis as in Fig. 60.

*Description*: Carapace. (External). *Holotype* adult male: length LV 0.725 mm, RV 0.71 mm; height LV 0.485 mm, RV 0.48 mm. *Paratype* ovigerous female: length LV 0.82 mm, RV 0.81 mm; height LV 0.54 mm, RV 0.53 mm. Carapace kidney shaped with curved dorsum; ventrum deeply incurved; hexagonal reticulation all over carapace; broad denticulation along posterior edge, and sometimes anterior edge, of valves—this denticulation occurs on a rim that contours both valves all around near flange and continuing in dorsal area where denticulation has appearance of saw (Fig. 48)—greatest height at about 1/3

from anterior, and greatest width at about 2/3 from anterior. LV longer especially in anterior area; overlap of LV over RV dorsally with stronger overlap at 1/3 from anterior (Figs 43-44). Reticulation of valves and denticulation along edge of valves present in juveniles (Fig. 46).

(Internal). Selvage narrow anteriorly and broad posteriorly in both valves; calcified inner lamella at least twice broader than outer lamella anteriorly, whereas nearly absent posteriorly. Hinge: fine groove in RV (Fig. 48) and ridge in LV; in LV, anterodorsally and posterodorsally small extension, for overlapping RV, covering the fine ridge. Central muscle field with inclined row of 3 broad horizontal sears and one behind middle one and a small one in front of top one; 2 mandibular sears below and in front. Radial pore canals numerous and straight. In male 4 rows of seminal vesicles parallel to dorsum and curved anteriorly and posteriorly to form complete tight loop at least posteriorly (Figs 39-40).

*Anatomy*. Antennula: (Fig. 49); 7 segmented; length/width ratio of last 6 segments:  $\frac{7}{12}$ ,  $\frac{7.5}{9}$ ,  $\frac{6}{8}$ ,  $\frac{3.5}{5.5}$ ,  $\frac{3}{3.5}$ ,  $\frac{3.5}{2.5}$ ; natatory setae almost as long as last 6 segments. No sensory organ seen on 2nd segment.

Antenna: (Fig. 50); sexually dimorphic; 2nd segment longer than 3rd; sense club (pitted near its tip) at about 3/5 from distal end of 2nd segment of endopod and about 1/2.4 its length; 5 long natatory setae extending further than tip of claws, and one small one; 4 claws in both sexes with one attached to 3rd segment longer and with 2 rows of longer teeth in male; length/width ratio of 3 endopod segments:  $\frac{22}{13}$ ,  $\frac{17}{8}$ ,  $\frac{4}{2.5}$ .

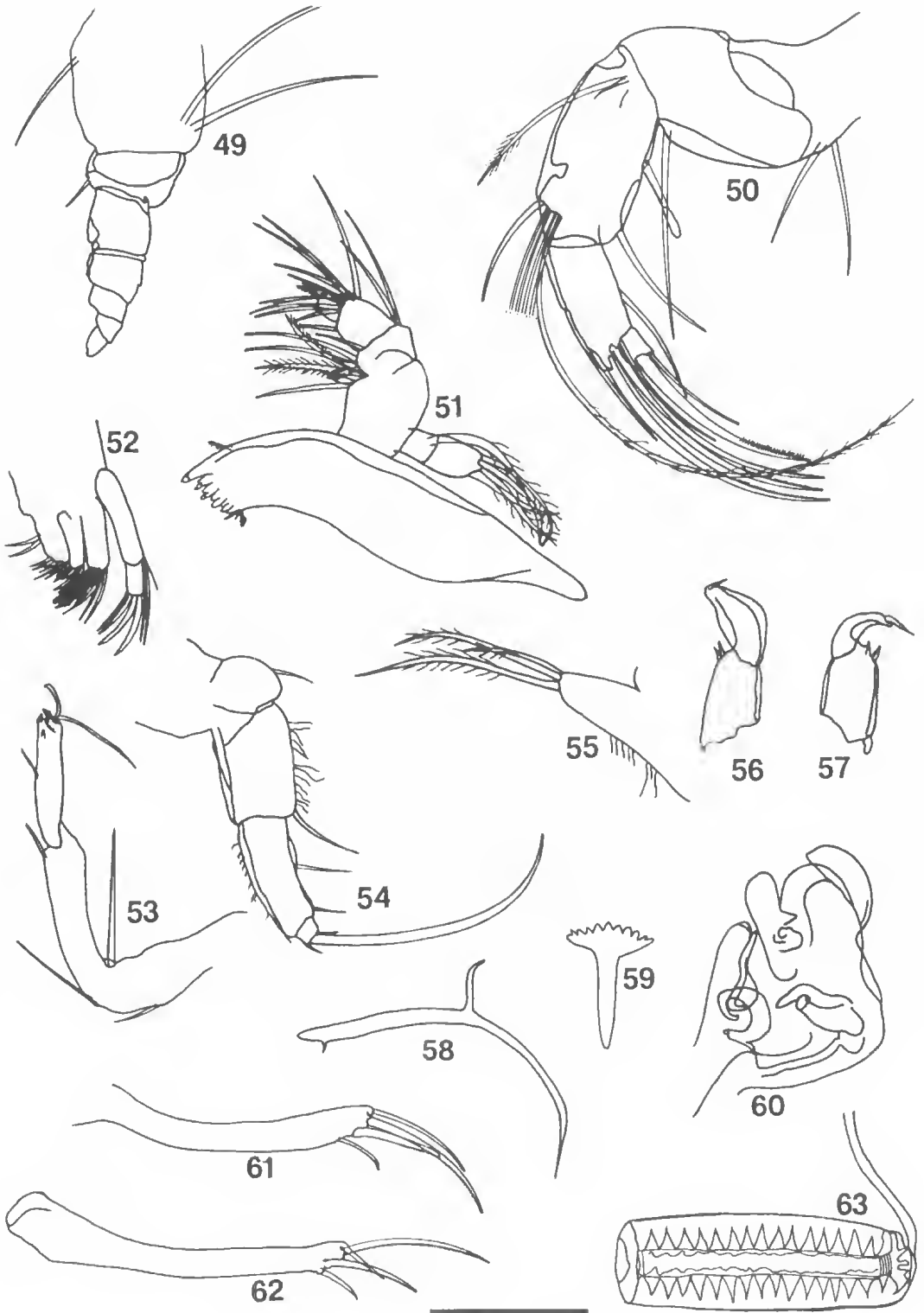
Mandible: (Fig. 51); last molar of coxa longer than last 3 and near its base are of 2 short pilose bristles; one pilose and broad bristle above longest molar. Epipod with 5 pilose Strahlen and one basal. Endopod long,

\* Originally misspelt as Diacypridinae.

Figs 49-63. *Reticypriis walbu* n. sp. Male holotype. 49: antennula (segments only); 50: antenna; 51: mandible; 52: maxillular palp with lobes; 53: thoracopoda II; 54: thoracopoda I. Female paratype. 55: maxillar palp. Male holotype. 56: maxillae palp; 57: other maxillar palp; 58: furcal attachment; 59: rake-like organ; 60: hemipenis; 61: furca. Female paratype. 62: furca. Male holotype. 63: Zenker organ.

Scale: 100 $\mu$  except for Fig. 59 which is 25 $\mu$ .





narrow and pilose  $\alpha$  and  $\beta$  bristles and longer smooth  $\gamma$  bristle.

Rake-like organ: (Fig. 59); 10 (in male) and 11 (in female) and narrow teeth with interior one bifid.

Maxillula: (Fig. 52); length/width ratio of palp segments:  $\frac{14}{3}$ ,  $\frac{4.5}{2.5}$ , end of palp with 2 smooth and thick bristles; 2 long setae attached to middle of 1st lobe on posterior side.

Maxilla: sexually dimorphic; in male (Figs 56-57) palps asymmetrical and bearing 2 small pointed setae at base of clasping palp; in female (Fig. 55) 3 pilose setae, each of different lengths, the longest one twice the length of small one.

Thoracopoda I: with penultimate segment undivided; claw as long as last 4 segments; for details of setae see Fig. 54.

Thoracopoda II: 2 terminal setae with longest one 3 times length of hook-shaped one; for details of setae see Fig. 53.

Hemipenis: lateral process banana-shaped and internal one strongly chitinized, brown in colour and cudgel in shape; for outline see Fig. 60.

Zenker organ: (Fig. 63); both ends slightly funnel-shaped and with 16 rosettes.

Furca: sexually dimorphic; 2 strong pectinate claws: anterior one nearly twice length of posterior; in male (Fig. 61) anterior bristle twice length of posterior and longer than posterior claw; in female (Fig. 62) both bristles of equal length and smaller than posterior claw.

Furcal attachment: (Fig. 58); long and strongly arched dorsally with one small dorsal branch curved away from articular extremity near which a small spike occurs ventrally.

Eye: cups of nauplius eye fused.

Colour of shell: (preserved in alcohol) females dark green; male light green.

*Remarks:* *Reticocypris walbu* differs from *R. herbsti* McKenzie, 1978 and *R. dedeckkeri* McKenzie, 1978 on the following grounds: the shell is reticulated entirely and is broadly denticulated all around the edge of valves (forming a saw tooth-like feature dorsally) whereas in the latter two species the shell is almost smooth anteriorly and posteriorly and bears very fine denticulations along the margin of the shell except in the dorsal area. The hemipenis outline also differs: see Fig. 60 and McKenzie (1978, p. 186, Figs 71, 76). The spike near the articular extremity of the furcal attachment was not described by McKenzie for *Reticocypris* but it was found on topotypic *R. herbsti*. This feature may be diagnostic of the Diacypridinae.

*Ecology:* All *Reticocypris* species are restricted to saline waterbodies and therefore it was not surprising to find *R. walbu* in the pool in Margaret River which Mitchell described as saline to taste. W. Zeidler collected this species at Davenport Spring on 2.xii.1974.

Subfamily: CYPRINOTINAE Bronstein, 1947  
Genus: HETEROCYPRIS Claus, 1893

***Heterocypris tatei* (Brady, 1886)**  
Figs. 64-96.

*Cypris tatei* Brady 1886, p. 89, Pl. 8: figs 5-6.

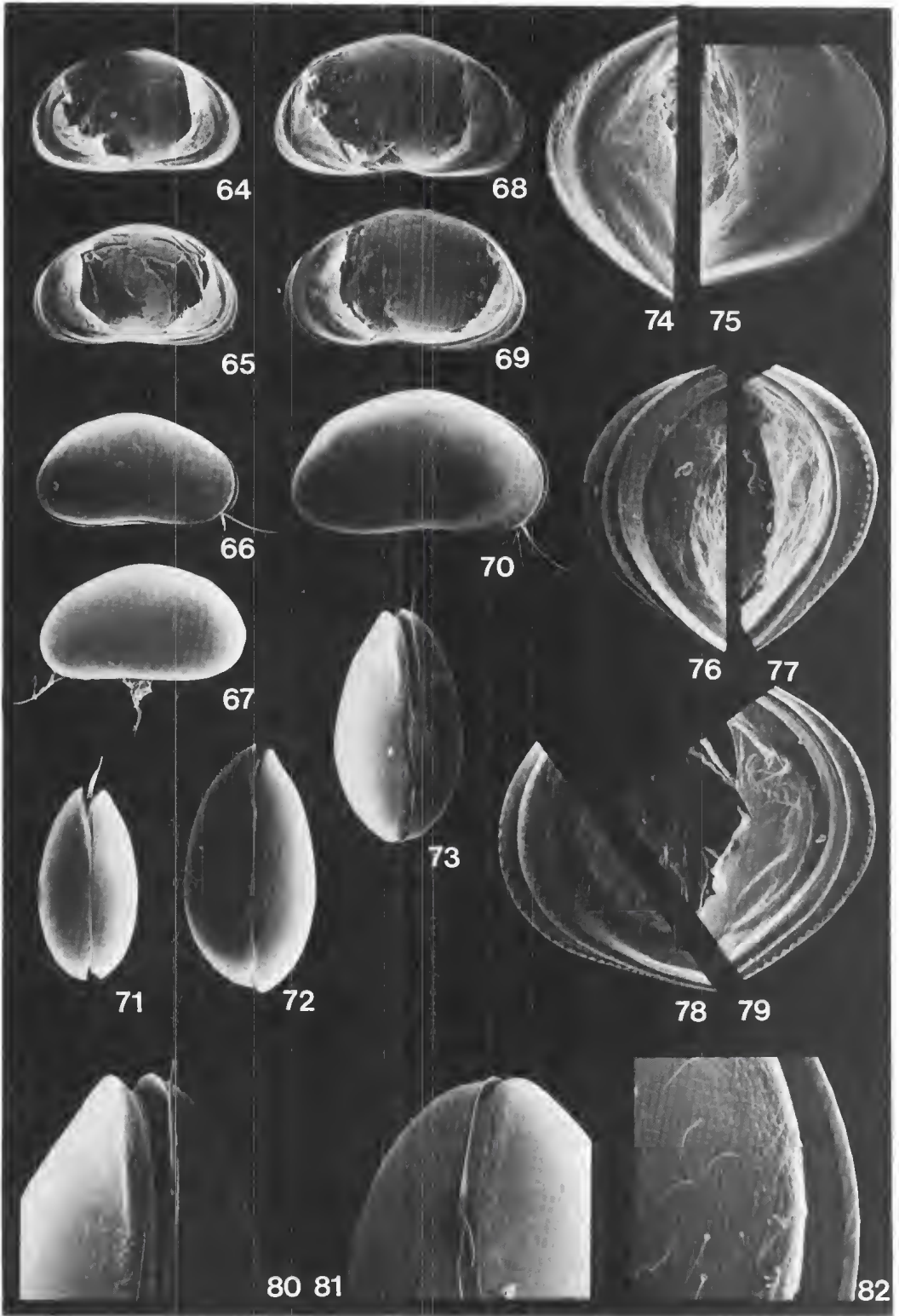
*Diagnosis:* Outline of hemipenis: lateral lobe "boot-shaped with the "heel" part of the boot tapering outward; angle of "foot" and "leg" part of the boot: 120°; slight indentation on inside of inner lobe at mid-length (see Fig. 90).

*Description:* A new description is presented here for *H. tatei* because Brady (1886) only described the carapace, and this was done insufficiently and incorrectly.

Carapace. (External). Adult male: length LV 1.86 mm, RV 1.84 mm; height LV 1.00 mm, RV 0.98 mm. Ovigerous female: length LV 2.26 mm, RV 2.20 mm; height LV 1.20 mm, RV 1.20 mm. Holotype (?male): cara-

Figs. 64-82. *Heterocypris tatei* Male 64: internal lateral LV; 65: internal lateral RV; 66: external lateral of carapace RV. 67: external lateral of carapace LV. Female 68: internal lateral LV; 69: internal lateral RV; 70: external lateral of carapace. Male 71: dorsal carapace. Female. 72: dorsal carapace; 73: ventral carapace; 74: detail of Fig. 68, posterior area; 75: detail of Fig. 68, anterior area; 76: detail of Fig. 69, anterior area; 77: detail of Fig. 69, posterior area. Male. 78: detail of Fig. 65, anterior area; 79: detail of Fig. 65, posterior area. Female paratype. 80: detail of Fig. 73, anterior area; 81: detail of Fig. 73, posterior area, upside down position. Male. 82: detail of Fig. 66, anterior area.

Figs. 64-73: approx. 15x; 74-79, 82: approx. 150x; 80-81: approx. 40x.



pace: length 1.63 mm; height 0.92 mm. Shell pseudopunctate and slightly pilose (Fig. 83); bean-shaped in lateral view with dorsum curved and with 2 slight humps: one in middle and other in posterodorsal area (most visible in female); behind posterior hump the dorsum is straight and forms an angle of 60° with the ventrum which is almost flat. Anterior more broadly rounded than posterior. Greatest height at about middle as well as greatest width. LV longer than RV especially anteriorly; in some females RV longer than LV posteriorly. Overlap of LV in antero- and posterodorsal areas and ventrally (Figs 71-73). Brady (1886) illustrated the contrary for the ventral overlap in fig. 6. However, the holotype carapace in the British Museum has an overlap identical to the specimens illustrated here.

(Internal). Anterior and posterior edge of RV with a row of small tubercles (Figs 76-81); selvage broad with RV anteriorly and posteriorly and faintly crenulated (Fig. 76); in RV, calcified inner lamella about same width as outer one anteriorly, and about 4 times width of that in posterior area. Hinges: fine ridge in RV and fine groove in LV. Radial pore canals: straight and numerous. Muscle scars: vertical row of 3, long and narrow, inclined scars with another broad one behind the middle one followed by a small one and another small one below the bottom scar; 2 mandibular scars below and in front of central field.

Anatomy. Antennula: (Fig. 82); 7 segmented; length/width ratio of last 6 segments:  $\frac{5}{7.5}$ ,  $\frac{10}{5.5}$ ,  $\frac{6.5}{4.5}$ ,  $\frac{5.5}{3.5}$ ,  $\frac{3.5}{1.75}$ ,  $\frac{4}{1.25}$ ; 2nd segment with small, rod-shaped and transparent, sensory organ at almost 2/5 from its base; 10 long, faintly plumose, natatory setae almost twice the length of last 6 segments together.

Antenna: (Fig. 84); sexually dimorphic; at base of 1st segment of endopod 3 setae of different length; middle one 3 times length of small one; presence of 4 claws in both sexes with the one attached to 3rd segment reaching the tip of the other 3 (in male with 2 rows of long teeth; in female smaller and thin with

fine teeth); presence of another external thick setae near the base of the claws, and 2/3 their length, in both sexes.

Mandible: mandibular coxale (Fig. 96) with 7 teeth, last one being longer than penultimate and, near its base, of 3 setae, 2 of which are pilose. Epipod with 5 slightly plumose Strahlen and a small one at its base. Endopod with  $\alpha$  bristle narrow and as long as the 2 long straight bristles,  $\beta$  bristle long, narrow and with few straight hairs and  $\gamma$  bristle club-shaped with straight spiky hairs.

Rake-like organ: (Fig. 92); 8 (in female) and 9 (in male) narrow and sharp teeth, the interior one bifid.

Maxillula: (Fig. 86); endopod with 17 plumose Strahlen and a few other bare ones;

length/width ratio of palp segments:  $\frac{9}{3}$ ,  $\frac{3.5}{2.5}$ ;

3rd lobe with 2 toothed Zahnborsten, with 6-4 teeth on anterior one and 4-2 on posterior; broad seta, with pilose tip, at base of 3rd lobe and 4/5 its length.

Maxilla: sexually dimorphic; in male, palps strongly asymmetrical (Figs 88-89); 5 plumose Strahlen on epipod and 13 terminal bristles on protopod and 2 subterminal ones; in female (Fig. 93), endopod with 3 plumose setae, one long in middle and 2 others of equal length and less than half the long one.

Thoracopoda I: penultimate segment divided and bearing 2 setae at anterior, near its base; claw slightly longer than last 2 segments; for details of setae, see Fig. 91.

Thoracopoda II: end of last segment with 2 setae, smallest one being hook-shaped; for further details see Fig. 87 a, b.

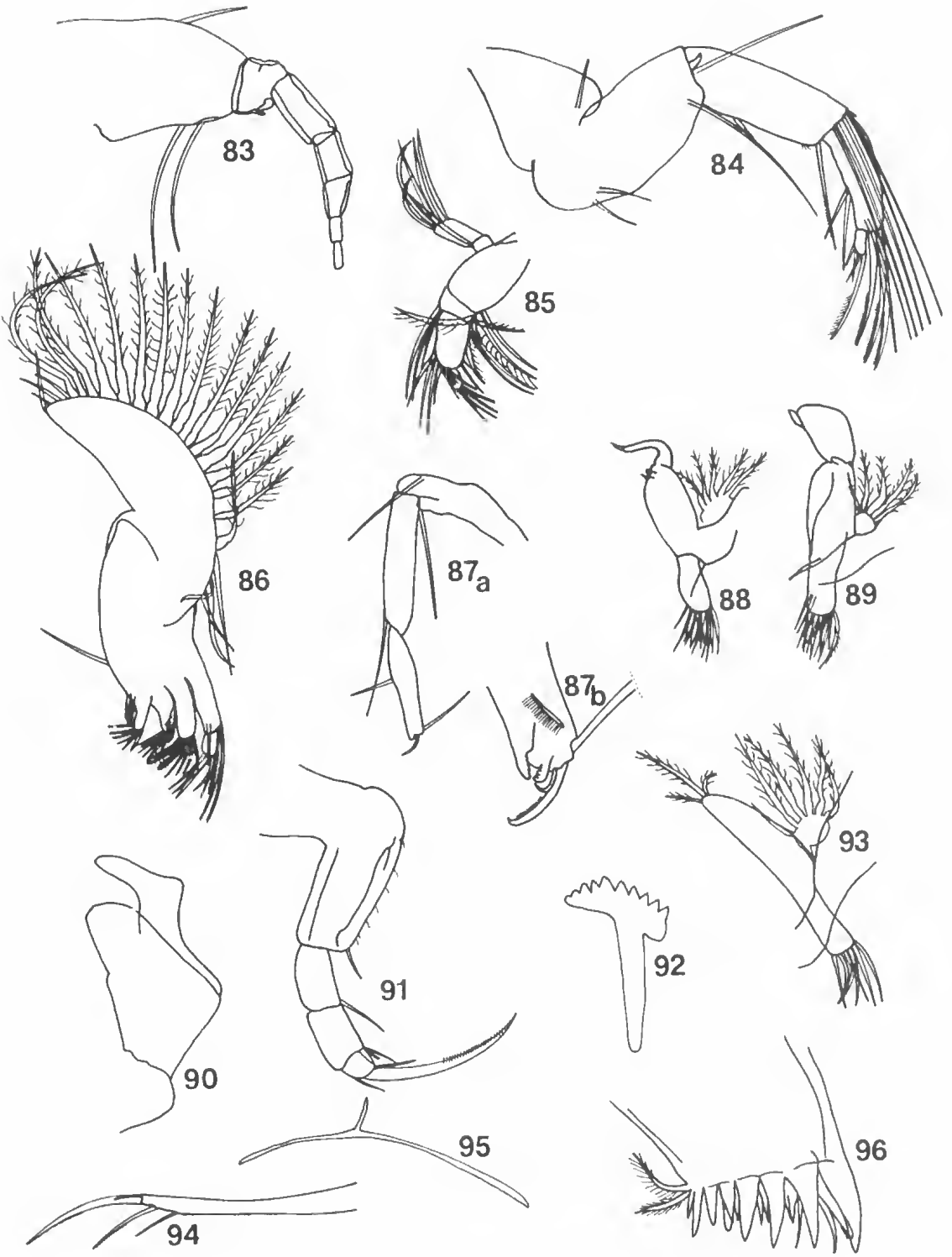
Hemipenis: lateral lobe "boot" shaped with "heel" part of the boot tapering outward; angle of "foot" with "leg" part of boot: 120°; slight indentation on inside of inner lobe at mid-length; for outline see Fig. 90.

Zenker organ: both ends rounded and 42 rosettes; middle of tube finely striated across length.

Furca: (Fig. 94); shaft with 2 rows of very fine hairs; 2 terminal claws and 2 terminal bristles: anterior bristle small in right furca

Figs. 83-96. *Heterocypris tatei* Male. 83: antennula (segments only); 84: antenna; 85: mandibular endopod. Female. 86: maxillula. Male. 87a: thoracopoda II; 87b: detail of distal end of thoracopoda II; 88: maxilla; 89: other maxilla; 90: hemipenis; 91: thoracopoda I; 92: rake-like organ. Female. 93: maxilla. Male. 94: furca; 95: furcal attachment; 96: detail of mandibular coxale.

Scales: 100 $\mu$  (large one for Figs. 87b, 92, small one for others).



and longer in left one where it is almost as long as posterior one. Claws unequal: posterior one 2/3 length of anterior.

Furcal attachment: (Fig. 95); slightly curved with dorsal branch very thin and curved away from articular extremity.

Eye: cups of nauplius eye fused; dark brown in colour.

Colour of shell: transparent to white when in alcohol.

*Distribution and ecology:* The original locality was given by Brady (1886) as "brackish pools in a dry creek at Adelaide". However, the holotype slide was labelled "Brackish Pools, Dry Creek, Adelaide". A river named "Dry Creek" exists in the north of Adelaide and it is thought to be the locality from which Professor R. Tate collected the specimens described by Brady. Part of Dry Creek has been transformed into a drain. *Heterocypris tatei* has been collected by B. D. Mitchell at a temporary pool near Hamilton Hill Homestead, at Coward Springs Railway Bore Swamp and Coward Springs. One emptied carapace was collected by K. F. Walker from Dalhousie Homestead Spring on 4.x.1975. This species has also been collected by J. Arnold on 9.vi.1977 in a pool at Beringboding Rock, W.A. (lat. 30° 34' S; long. 118° 29' E).

This ostracod, as for most species recorded in the genus, is a common inhabitant of temporary pools. It is not surprising therefore to find it in the various pools and swamps in the area studied as well as in one of the springs (Coward Springs) where the conductivity was

6811 mmho. Inhabitants of temporary pools can usually withstand slight salinities but are never found in saline lakes.

*Remarks:* Outside Australia, the average length for *Heterocypris* species is about 1 mm. *H. tatei* and *H. leana* (Sars 1896) are exceptions. The length of the adult female of the latter species is 2.70 mm and the size of some *Heterocypris* spp. can vary greatly: *Heterocypris aurea* (Sars 1896) described from South Africa had a length of 1.32 mm (male) and 1.60 mm (female) but Daday (1913) recorded for it a length of 2.2 mm (male) and 2.5 mm (female), (McKenzie 1971). The holotype of *H. tatei* is slightly smaller than the specimens described here but the length/height ratio is very similar for Brady's specimens and for those from the Mound Springs area.

It is important to point out the difference in sizes of specimens within a species because many *Heterocypris* species have been distinguished only on the basis of the length and height of the carapace.

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